

NOTES ON ERIAN (DEVONIAN) PLANTS FROM NEW YORK AND  
PENNSYLVANIA.

BY

D. P. PENHALLOW, F. R. S. C.,  
*McGill College, Montreal.*

(With Plates IX-XIV.)

Among a large number of Erian plants submitted to Sir William Dawson and myself by Mr. C. S. Prosser, of the U. S. Geological Survey, were several which seemed to admit of ready identification. The larger part were, however, of a doubtful character, in small fragments, or appeared to be hitherto undescribed, and thus demanded special examination. The results obtained by me are embodied in the following notes:

The history of the specimens, as derived from Mr. Prosser, is as follows:

Nos. 3, 6, and 7 are from Skunnemunk Mountain, Orange County, N. Y. The rocks from which they were obtained are designated simply as Devonian.

No. 45 is from the same locality, but derived from the collection of Prof. D. S. Martin, of New York City.

Nos. 8, 9, 19, and 36 are from the Upper Chemung of Lanesboro, Susquehanna County, Pa., and are deposited in gray mica slate.

Nos. 15, 28, and 32 are from the Hamilton Group of West Hurley, Ulster County, N. Y.

Nos. 21, 24, 27, 37, 38, 39, and 41 are from the Genesee shale of Lake Canandaigua, N. Y.

Nos. 25 and 42 are from the Genesee Shale of Penn Yan, N. Y., while No. 20 is from the Marcellus Shales at Union Springs, Cayuga Lake, New York.

Owing to the very imperfect nature of much of this material I have deemed it expedient to separate all such from the more determinable, and have thus brought the whole under the two general heads of (1) dubious species and (2) determinable species.

DUBIOUS SPECIES.

A number of the specimens consist of small fragments and show either so little structure or so complete an absence of it as to render it inexpedient to assign any definite positions to them at the present time, more particularly as they can not be made to harmonize with any

previously described species, although in one or two cases there are certain general resemblances which may prove to have greater significance when more complete material is secured. It will, therefore, be sufficient to place their descriptions on record.

No. 24 is a fragment of a small, branching plant of very imperfect preservation and obscure characters.

No. 45 is a fragment of some large plant, which shows a number of coarse, parallel striae, the fragment being too small to exhibit their terminations. I should be inclined to refer this to *Calamites transitionis* Göpp. or to some closely allied species.\* Comparison should be made with *Calamites ramosus* Artis., and *C. pachyderma* Brongn.† also with *Bornia radiata* Brongn.‡ and *B. scrobiculata* Sternb.§

Nos. 6 and 7 are probably structures of the same nature. They represent aggregations of similar, simple, straight filaments about 1.5 to 2<sup>mm</sup> in diameter, disposed in a parallel manner. They were originally structures of considerable volume, as their transverse section is nearly round. It is not unlikely that they represent roots, but it is impossible to assign them to any particular plant.

Nos. 27 and 37 are fragments of similar linear, branching stems, 11 and 12<sup>cm</sup> long by 3 and 5<sup>mm</sup> wide. They show no structure whatever and can not at present be referred to any species.

No. 38 is a fragment of a stem without branches, 8<sup>cm</sup> long and 1.5<sup>cm</sup> wide. It shows no structure beyond four longitudinal and parallel ridges or nerves, which are about equidistant. It is probable that this may be a fragment of the same species as No. 25.

No. 41 is a narrow stem 12<sup>cm</sup> long and 3<sup>mm</sup> wide, showing no lateral members for a distance of 7<sup>cm</sup> beyond which there appear, on opposite sides, what are either the stumps of branches, or more probably, perhaps, the basal portions of leaves. They are distant 3<sup>cm</sup>. The specimen bears a slight resemblance to *Parka decipiens*, but the relation can not be satisfactorily established.

Nos. 23 and 40 are of the same nature. Each is a small fragment of a stem showing near one end a pair of branches or leaves, of which only the basal portions remain. The stem is 4<sup>mm</sup> wide. The specimens are altogether too fragmentary to admit of their reference to any species, but in this connection reference should be made to *Calamites radiatus*|| Brongn. (*Archæocalamites*, Sternb.), as it is quite possible these fragments may be parts of this plant.

\* Göppert: Foss. Flora des Übergangsgebirges, p. 116, Pl. III, IV. Dawson: Foss. Plants of the Dev. and U. Sil. of Canada, Geolog. Survey of Canada, 1871, p. 25, Pl. IV.

† Brongniart: Hist. des Vég. Foss., 1, 127, Pl. XVII, XXII.

‡ Schimper: Traité de Pal. Vég., Pl. XXIV.

§ Göppert: Foss. Flora des Übergangsgebirges, Pl. X.

|| Dawson: Geol. Hist. of Plants, p. 170; Solms Laubach: Foss. Bot. Eng., ed. Trans. p. 320, Fig. 44; Brongniart: Hist. des Vég. Foss., 1, p. 122, Pl. XXVI; Dawson: Foss. Plants of the Dev. and U. Sil. of Canada; Geolog. Survey of Canada, 1871, p. 25, Pl. IV, Fig. 42.

Nos. 21 and 39 are two short fragments 7<sup>mm</sup> wide and 7.5<sup>cm</sup> long. Each shows near its base a short stump of a lateral member, and alternately with this at the top, a lateral member which is 3.5<sup>cm</sup> long and 4<sup>mm</sup> wide. The surface shows no structural markings beyond three longitudinal striae. It is very probable that these are fragments of a fern stipe of species similar to No. 25, although it is also to be observed that they bear a certain resemblance to highly altered specimens of *Psilophyton* nerve recently brought under my notice.

No. 25 is an imperfect specimen, of which one side is wholly wanting. It is 1.8<sup>cm</sup> wide and 22<sup>cm</sup> long. On one side it shows the basal portions of five pinnæ with enlarged articulations. They are distant 3.5<sup>cm</sup> and 6<sup>cm</sup>. The surface shows two coarse longitudinal ridges and numerous fine striae. This is an undoubted *Cyclopteris*,\* and closely resembles a specimen in the Peter Redpath Museum of McGill College, marked *C. Acadica*.

No. 26 consists of narrow, leaf-like filaments 2<sup>mm</sup> wide at the base, but broadening upward to 4<sup>mm</sup>. At a total length of 9<sup>cm</sup> they are incomplete. They show no structure beyond two nerves. They are strongly suggestive of the leaflets of a Cycadaceous plant. They are also equally suggestive of the leaves of *Schizoneura paradoxa* Sch.† or of *S. Meriani* Sch.‡ with which comparison should be made. [Pl. IX, Fig. 3.]

No. 3 consists of linear filaments 2 to 4<sup>mm</sup> wide, with a somewhat conspicuous midrib or axis. A small fragment on the opposite side of the stone shows a branching similar to that of *Haliserites*, but as it is not repeated it might also be that of a root. It is a very problematical specimen, which requires further material for determination. It is not unlikely that it represents a poorly preserved specimen of *Haliserites Dechenianus*. [Pl. IX, Fig. 4.]

No. 42 consists of a tuft of narrowly linear, simple filaments, apparently leaves, about 0.75<sup>mm</sup> in diameter and upwards of 14<sup>cm</sup> long. No structure is apparent, and the specimen is altogether too incomplete to admit of reference to a particular species. [Pl. X, Fig. 5.]

#### DETERMINABLE SPECIES.§

Specimens numbered 8, 9, 16, 17, 18, 19, 20, and 36 present many features in common. They all agree in their regular dichotomous divisions and linear ramuli. None of them show signs of fructification, while some are distinctly costate and others are not.

\* Rept. on Foss. Plants of the Dev. and U. Sil. of Canada, Geol. Surv. of Can. 1871. 215; pl. xv.

† Schimper: *Traité de Pal. Foss.*, Pl. XIII, Fig. 8.

‡ *Ibid.*, Pl. xv, Fig. 1.

§ In connection with my determination of these species, I desire to acknowledge the courtesy with which Dr. W. G. Farlow of Harvard University, placed at my disposal his valuable collection of Marine Algae; also to Dr. G. L. Goodale for permitting reference to the large collection of fossil plants in the Museum of Comparative Zoölogy.

Upon an informal examination I was inclined to regard them as altogether distinct from *Haliserites Decheuianus* Göpp, to which certain of them had been referred; but, after carefully describing each separately and comparing them with one another, it became evident that a generic relationship existed between them, while repeated examinations only tended to strengthen the view that some at least could be identified with *Haliserites*, while others must be nearly related. In order to ascertain their proper relationships it will be desirable to examine the characters of the genus *Haliserites* as employed by Sternberg and Göppert and compare this genus with the modern genera *Haliseris* and *Dietyota* in order to ascertain upon which it was based.

Sternberg\* applied the following characters to the genus *Haliserites*:

Frons plana, membranacea, costata, sporangia capsularia in lamina frondis ad costam coacervata.

Göppert,† in assigning the species *Decheuianus* to this genus, describes it in the following terms:

Fronde plana attenuatim dichotome ramosa, ramis ramulisque linearibus costatis aequalibus apice quandoque circinatis, costis mediis.

From this description, as also from his figures, it seems probable that he confounded *Psilophyton* with *Haliserites*. In fact some of his plants referred to the latter have been shown to belong to the former. With respect to what belong properly to *Haliserites*, he elsewhere‡ speaks of both broad and narrow forms. It is therefore most probable that this genus was based upon the modern species *Haliseris dichotoma* Sprengel,§ as it shows also both narrow and broad forms, and the agreement with *Haliserites* is very close throughout, but the *Haliseris dichotoma* of Sprengel is now *Dietyota dichotoma* of Lamouroux, a fact which it is important to keep in view, while we should also not lose sight of the fact that certain species of *Dietyota*, e. g. *D. divaricata* Agh., show recurved terminations, which, with the dichotomous division, give the plant the appearance of many specimens of *Psilophyton*. *Haliseris* and *Dietyota* differ in their external characters, apart from the fruit, in the fact that in the former there is a distinct midrib and the terminations of the ultimate ramifications are simple, while in the latter the ramuli are not costate and their terminations are generally bitid. Both agree in having a regularly dichotomous frond with more or less linear divisions.|| This, together with the transfer to *Psilophyton* of a number of plants originally referred by Göppert to *Haliserites*, seems to render it desirable to give a fresh definition of the characters which distinguish this latter genus.

\*Sternberg: Vers., II, p. 31.

†Göppert: Foss. Flora des Übergangsgebirges, p. 88, Pl. II. See also pp. 10 and 259.

‡*Ibid.*, p. 89.

§Sowerby: English Bot., XII, p. 44, Pl. 2336.

||Sowerby: English Bot., XII, pp. 138, 49, 109. Harvey: Nereis Boreali Americana, I, pp. 102, 108, Pl. VII, A.



In the light of these data, it becomes possible to separate our fossils into two groups. Nos. 8, 9, 16, 17, and 36 are costate throughout and show single terminations of the ramuli. Their affinities are thus clearly with *Haliseris* and they must, therefore, be referred to the genus *Haliserites*. Nos. 18, 19, and 20 are not costate and the terminations of the ramuli are distinctly bifid. Their affinities are with *Dictyota* and they consequently should be referred to a related genus.

Brongniart\* formerly referred a large number of fossils of diverse character to the genus *Fucoides*, some of which he brought under the division *Dictyotites* from the general resemblance they bore to *Dictyota*. These have since been variously distributed among different genera, so that the name *Dictyotites* has lost its function, and so far as I am aware it is now altogether obsolete. It therefore seems admissible to reintroduce the name as a generic one, under which specimens 18, 19, and 20 may be described.

*Haliserites Dechenianus* Göpp. Pl. x, Fig. 6.

This species is represented in No. 17 by an imperfect plant answering to the following:

Fronde dichotomous; divisions linear 3.5<sup>mm</sup> wide; angle of divergence 40°; midrib prominent throughout, margin wavy.

The specimen shows no normal terminations of any of the ultimate divisions, but its general characteristics are otherwise so well defined that it is quite safe to refer it to the above species. Mr. Prosser informs me that this fossil was identified by Lesquereux as a *fruiting* frond of *H. Dechenianus*. This I consider inadmissible. The parts mistaken by Lesquereux for fruit are, as the specimen clearly shows, nothing else than alternate elevations and depressions in the marginal portions of the ramuli caused by a wavy margin such as is not uncommon among membranaceous algae.

*Haliserites Dechenianus* Göpp., var. *lineatus* Pn., nov. var. Pl. x, Fig. 7.

In No. 8 the frond is regularly dichotomous throughout; divisions linear, sometimes somewhat narrower at the base, chiefly 2.25<sup>mm</sup> broad. The divergence of members is from 30° to 44°, chiefly about 40°. Midrib well defined throughout, but small. Margins regular.

This appears to correspond to the narrow form of Göppert's *H. Dechenianus* and, according to Mr. Prosser, it was so identified by Lesquereux. It would seem better, however, in view of the conspicuous differences between it and the preceding, to distinguish it by a varietal name, for which I would suggest the one given above.

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\* Histoire des Vég. Fossiles, p. 67, Pl. v, vii, and ix.

*Haliserites lineatus*, sp. nov. Pl. X, Fig. 8a; Pl. XI, Fig. 8b.

This is represented by the two specimens, Nos. 16 and 36, which are undoubtedly only forms of the same species. In No. 16, the frond is dichotomous, divisions linear. Larger ramuli 2.25 to 4<sup>mm</sup> broad, the terminal ramuli 0.5 to 1.5<sup>mm</sup> broad. Divergence of members 30° to 50°. Costate throughout, margins strict.

In No. 36 the frond is dichotomous, divisions linear. Principal ramuli 3<sup>mm</sup> wide, ultimate divisions 1<sup>mm</sup> or less. Divergence of the larger members about 14°, of the smaller divisions 26° to 30° and 40°. Costate throughout, margins regular.

No. 16 was identified by Lesquereux as a narrow form of *H. Dechenianus*, but I think the difference too great.

*Haliserites chondriiformis*, sp. nov. Pl. XI, Fig. 9.

No. 9 is a specimen which presents, at first sight, very peculiar features. It is somewhat remarkable for the wide divergence of its principal members, for an apparent stipe and the peculiar form of one of its chief divisions. On close examination, it is seen that the otherwise regular division of the frond is disturbed by an abnormal growth in one of its principal segments. The apparent stipe resolves itself into the midrib, from which the marginal parts have been more or less completely separated by decay, as is obvious from detached fragments which lie along each side. The midrib itself is prominent as a depressed line, showing the collapse of what was originally a somewhat bulky structure, but it seems to disappear shortly after passing into the more expanding portions of the frond. A detailed examination shows a dichotomous frond, divisions linear, sometimes broadening upward. Principal angles 90°; those of the ultimate divisions 40° to 55°, chiefly 55°. Ramuli 2 to 3<sup>mm</sup> wide. Midrib obvious, becoming very prominent in the basal portions. Margin regular.

The general features of this fossil are closely represented among modern algae by *Haliseris delicatula* Lamour., but much more closely by *H. Mueleri*, which shows the same narrow, stipe like base with the Chondriiformis divisions of the principal part of the frond.

*Dictyotites fasciologus*, sp. nov. Pl. XI, Fig. 10a; Pl. XII, Fig. 10b.

In No. 19 the fronds are dichotomous, divisions numerous and narrowly linear, 1.5<sup>mm</sup> wide, forming a more or less tufted mass. Primary divisions for the most part obscure, but obviously bifid, the lobes short and rounded.

In this fossil the narrow ramuli are so massed as to obscure the normal division, but from the terminations of the ramuli it is probably safe to refer it to *Dictyotites*, although the state of preservation does not admit of determining the presence of a midrib. Its whole aspect is so

strongly suggestive of *Dictyota fasciola* Lamour.\* that I have deemed it advisable to assign it the above name.

In No. 18 we also have a plant which is in all probability the same species.

Fronds dichotomous, ramuli narrowly linear, 1 to 1.5<sup>mm</sup> wide and not costate, aggregated in tufts. This is a very imperfect specimen, but I think there can be little doubt as to its identity with the preceding.

*Dictyotites maximus*, sp. nov. Pl. XI, Fig. 11.

No. 20 is a fragment of a plant so imperfectly representing important details of structure as to render its proper relationship extremely problematical.

Fronds regularly dichotomous, divisions linear, 2.75 to 3.5<sup>mm</sup> wide. Divergences of members 55° to 60°. Midrib none, margins regular.

In this specimen there are no normal terminations of the ramuli, and the state of the preservation is such as to render it impossible to determine if the plant was originally costate. At each bifurcation, a third member is seen, but from their relative positions I am led to consider them parts of another plant accidentally associated. The plant is certainly either *Haliserites* or *Dictyotites*, but which is doubtful. I will, therefore, refer it provisionally to *Dictyotites maximus* as indicative of its obviously large size.

*Psilophyton grandis*, sp. nov. Pl. XII, Fig. 12a; Pl. XIII, Fig. 12b; Pl. XIV, Fig. 12c.

The material comprised in Nos. 15, 28, and 32 is all of the same character and obviously fragments of plants of the same species. No. 15 shows on one side numerous fragments of narrow stems of the same size and character as in No. 32. On each side of the main axis there is a row of compactly arranged acute scales 1<sup>mm</sup> broad at the base in a vertical direction and 2<sup>mm</sup> long. There is also a circinate termination of a branch, which measures 1<sup>cm</sup> in diameter. The opposite side of the same slab shows two fragments of stems. These are 18<sup>cm</sup> long and 1.5<sup>cm</sup> wide, each. They show a somewhat carbonized mass, but no well-defined surface markings. The margins show well developed scales. These are 2<sup>mm</sup> broad at the base—measured vertically—and are distant, from center to center, 5<sup>mm</sup>. They are all more or less broken off, but a prolongation of their sides shows them to have been lanceolate, acute, slightly curved upward, and 5<sup>mm</sup> long.

In No. 28 there are on one side of the slab fragments of branching stems 6<sup>mm</sup> to 8<sup>mm</sup> wide, with lateral rows of closely arranged scales of the same dimensions as in 32 and 15. None of these stems show well-defined surface markings.

On the opposite side of the slab are dichotomously branching stems of all sizes, evidently parts of the same or of similar plants. Nearly all

\*Harvey: *Nereis Boreali Americana*, t, 108, Pl. VII, B.

these stems show more or less well-defined and perfect lateral rows of scales which are triangular, acute, 1<sup>mm</sup> broad at the base and 2<sup>mm</sup> long. In the larger stems the scales become somewhat larger. There are few surface markings, but where they occur they are the same as in No. 32. No. 32 is chiefly represented by a branching stem 5<sup>mm</sup> wide and 21<sup>cm</sup> long. The branch separates from the main stem by a somewhat narrow angle, a feature which characterizes nearly all the fragments on these three slabs. Lateral rows of scales are prominent. These are triangular, acute, 1<sup>mm</sup> long by 0.5<sup>mm</sup> broad at the base, and are closely arranged. This stem does not show any well-defined surface markings.

There are also numerous short fragments of stems. One of these is 1<sup>mm</sup> broad and branching, and is an undoubted *Psilophyton*. Other pieces show somewhat obscure superficial markings in the form of pits similar to those in *Psilophyton robustius* and *P. princeps*. Others again show distinct transverse markings, which are triangular, acute, 1<sup>mm</sup> broad at the base and 2<sup>mm</sup> long. They are undoubtedly to be regarded as the scales of the stems turned over and flattened down upon it transversely to its axis. From their relative positions, it is probable that the scales are disposed spirally.

From these details it would seem clear that the plant in question must be a *Psilophyton*, but differing materially from those already described,\* chiefly in point of size and in the size and aggregation of the scales. I would, therefore, propose for it the name of *Psilophyton grandis*, as it was obviously a plant of much larger dimensions than any of the hitherto known species.

Upon the data thus presented, the following classification becomes admissible.

Genus **HALISERITES** Sternb.

Fronds plane, membranaceous, costate and dichotomous throughout; the more or less linear ramuli with simple terminations. Sporangia in groups lateral to the midrib.

**Haliserites Dechenianus** Göpp.

Fronds regularly dichotomous; the divisions linear, 3<sup>mm</sup> or more wide; margins regular or wavy, terminations strict. Angles of divergence about 40°. Equally and strongly costate throughout.

**Haliserites Dechenianus** Göpp., var. *lineatus*, nov. var.

Fronds regularly dichotomous throughout; divisions linear, often somewhat narrower at the base, 2.25<sup>mm</sup> broad. Divergence of members 40°, margins regular, midrib well defined throughout, but not prominent.

\*Dawson: Foss. Plants of the Dev. and U. Sil. of Canada, Geological Surv. of Canada, 1871, pp. 37-41, Pl. 1x, x.



**Haliserites lineatus**, sp. nov.

Fronds dichotomous throughout; divisions linear, the larger members upwards of 4<sup>mm</sup> broad, the terminal ramuli 1<sup>mm</sup> or less, and strict. Divergence of members from 14° to 50°. Costate throughout, costa not prominent; margin regular.

**Haliserites chondriformis**, sp. nov.

Fronds dichotomous; divisions linear, the larger members sometimes exhibiting an unusual form. Ultimate ramuli 2 to 3<sup>mm</sup> broad, strict. Principal angles of divergence 90°, those of the smaller members, 40° to 55°. Midrib obvious, becoming very prominent below; the base of the frond contracted into a narrow stipe; margins regular.

The general aspect is that of *Chondrus*.

(Genus **DICTYOTITES**, gen. nov.)

Fronds plane, membranaceous, and regularly dichotomous, the ultimate ramuli generally bifid. Midrib none, margins regular.

**Dictyotites fasciolus**, sp. nov.

Fronds dichotomous, divisions narrowly linear, 1 to 1.5<sup>mm</sup> wide, and generally aggregated in tufts.

**Dictyotites maximus**, sp. nov.?

Fronde regularly dichotomous, the divisions linear, about 3<sup>mm</sup> broad. Divergences of members about 60°. Margins regular.

(Genus **PSILOPHYTON** Dn.)**Psilophyton grandis**, sp. nov.

Stem 1.5<sup>cm</sup> in diameter, branching dichotomously into slender ramifications; angles of divergence narrow; terminations of branchlets circinate. Leaves in the form of spirally arranged, lanceolate, and acute scales curved slightly upward, those of the main stem 2<sup>mm</sup> broad at the base and 5<sup>mm</sup> long, distant 5<sup>mm</sup>; those of the branches becoming smaller and more closely aggregated, finally 1<sup>mm</sup> broad and 2<sup>mm</sup> long. Surface markings as poorly defined pits or short longitudinal striae. Fruit none. Plants chiefly found as impressions, rarely carbonized.

## EXPLANATION OF FIGURES. Plates ix-xiv.

- No. 1. Fragment of a fern? Similar to No. 25. Natural size.  
 No. 2. Fragment of a fern? Rhachis  $\times \frac{2}{3}$ .  
 No. 3. Leaves of *Schizoneura*? or some allied plant. Natural size.  
 No. 4. Roots or possibly *Haliserites*. Natural size.  
 No. 5. Grass-like leaves of undeterminable character. Natural size.  
 No. 6. Frond of *Haliserites Dechenianus* Göpp., showing a wavy margin. Natural size.

- No. 7. Frond of *Haliscrites Dechenianns* Göpp., var. *lineatus*, Pen. Natural size.
- No. 8a. Frond of *Haliscrites lineatus* Pen.  $\times \frac{3}{8}$ .
- 8b. A frond of the same species. Natural size.
- No. 9. *Haliscrites chondriiformis* Pen. Natural size.
- No. 10a, b. Fronds of *Dictyotites fasciolus* Pen. Natural size.
- No. 11. Partial frond of *Dictyotites maximus?* Pen. Natural size.
- No. 12. Various portions of *Psilophyton grandis* Pen., showing circinate termination, ramification, leaves, etc.
- (a) Showing various portions of branching stems which also exhibit the scales. Natural size.
- (b) Portions of the large stems showing the scales.  $\times \frac{1}{13}$ .
- (c) A branching stem showing fine scales. Natural size.